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RS-02-182

October 18, 2002

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Quad Cities Nuclear Power Station, Unit 1
Facility Operating License No. DPR-29
NRC Docket No. 50-254

Subject: Additional Information Supporting the Request for Technical Specifications Change for Minimum Critical Power Ratio Safety Limit

References: (1) Letter from P. R. Simpson (Exelon Generation Company, LLC) to U. S. NRC, "Request for Technical Specifications Change for Minimum Critical Power Ratio Safety Limit," dated May 30, 2002

(2) Letter from P. R. Simpson (Exelon Generation Company, LLC) to U. S. NRC, "Supplemental Request for Technical Specifications Change for Minimum Critical Power Ratio Safety Limit," dated August 15, 2002

In Reference 1, in accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (EGC) requested a change to the Technical Specifications (TS) of Facility Operating License Number DPR-29 for the Quad Cities Nuclear Power Station (QCNPS), Unit 1. The proposed change revises the values of the Safety Limit for the Minimum Critical Power Ratio (SLMCPR) in TS Section 2.1.1, "Reactor Core SLs," for Unit 1 Cycle 18 for both two loop operation and single loop operation to 1.10 and 1.11, respectively. A supplemental request (i.e., Reference 2) was submitted on August 15, 2002, to correct an error in the determination of the SLMCPR limits for QCNPS Unit 1 Cycle 18.

In an October 8, 2002, telephone conference call between representatives of EGC and members of the NRC, the NRC requested additional information regarding this proposed change. Attachment A to this letter provides the requested information.

Some of the information in Attachment A is classified as proprietary to our fuel supplier, Global Nuclear Fuel (GNF), and is identified as text contained between opening double brackets ([[) and closing double brackets (]]). The proprietary information is of the type that GNF maintains in confidence and withholds from public disclosure. It has been handled and classified as proprietary as supported by the affidavit in Attachment C.

APO1

EGC hereby requests that this information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.790, "Public inspections, exemptions, requests for withholding." Attachment B provides an edited, non-proprietary version of the information in Attachment A.

EGC has reviewed the information supporting a finding of no significant hazards consideration that was previously provided to the NRC in Attachment C of Reference 1. The supplemental information provided in this submittal does not affect the bases for concluding that the proposed TS change does not involve a significant hazards consideration.

Should you have any questions related to this letter, please contact Mr. Kenneth M. Nicely at (630) 657-2803.

Respectfully,

P.R. Simpson

P. R. Simpson
Manager – Licensing
Mid-West Regional Operating Group

Attachments:
Affidavit
Attachment A: Response to Request for Additional Information Relating to Amendment Request for Cycle 18 Safety Limit Minimum Critical Power Ratio (PROPRIETARY VERSION)
Attachment B: Response to Request for Additional Information Relating to Amendment Request for Cycle 18 Safety Limit Minimum Critical Power Ratio (NON-PROPRIETARY VERSION)
Attachment C: Global Nuclear Fuel Affidavit

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

STATE OF ILLINOIS	)	
COUNTY OF DUPAGE	)	
IN THE MATTER OF	)	
EXELON GENERATION COMPANY, LLC	)	**Docket Number**
QUAD CITIES NUCLEAR POWER STATION, UNIT 1	)	**50-254**

SUBJECT: Additional Information Supporting the Request for Technical Specifications Change for Minimum Critical Power Ratio Safety Limit

AFFIDAVIT

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information and belief.

P. R. Simpson
Manager – Licensing
Mid-West Regional Operating Group

Subscribed and sworn to before me, a Notary Public in and for the State above named, this 18th day of October, 2002

Notary Public

Attachment B

Response to Request for Additional Information Relating to Amendment Request for Cycle 18 Safety Limit Minimum Critical Power Ratio (NON-PROPRIETARY VERSION)

ATTACHMENT B

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
RELATING TO AMENDMENT REQUEST FOR CYCLE 18 SLMCPR
QUAD CITIES NUCLEAR POWER STATION, UNIT 1
DOCKET NO. 50-254

Question 1

Clarify that Table 2 of Attachment A (Reference 2) replaces Table 2 of Attachment F (Reference 1), and provide details of how the derived quantities for effective total bundle power uncertainties are obtained, including assumptions, approved methodology used, and the impact on power distribution uncertainties and contribution to the SLMCPR calculation.

Response

It is correct that Table 2 of Attachment A of Reference 2 replaces Table 2 of Attachment F of Reference 1. The effective total bundle power model uncertainty (σ_B) is determined from Eq. (3-3) of NEDC-32694P-A (Reference 3) [[ ]] Although the values of the components are different for the GETAB and Revised Safety Limit Minimum Critical Power Ratio (SLMCPR) methodologies, the determination of σ_B is equivalent. The uncertainty component due to local power range monitor (LPRM) updates and instrument failure (σ_U) has [[ ]] components that combine to a value of [[ ]] as indicated by the equation at the bottom of page 3-5 of NEDC-32694P-A. The individual values for these [[ ]] components and their descriptions are summarized in rows three and four of Table 4.2 of NEDC-32694P-A. [[ ]] To illustrate this difference it is beneficial to expand the model uncertainty (σ_M) as indicated in Eq. (3-2) on page 3-1 of NEDC-32694P-A [[ ]] Values for these components are indicated in the first two rows of Table 4.2 of NEDC-32694P-A. [[ ]] See page 3-2 of NEDC-32694P-A for more discussion. For the Revised methodology using the reduced power distribution uncertainties derived for 3D-MONICORE, the value for σ_{PAL} is [[ ]] as shown in row 2 of Table 4.2 of NEDC-32694P-A. For either of the NRC-approved methodologies, Eqs. (1) and (2) can be combined and rearranged to obtain [[ ]] The equivalent terms shown in Eq. (3) are introduced so that the differences in how these components are treated in the GETAB and Revised methodologies can be described. The division of σ_{TIPSYS} by $\sqrt{4}$ occurs because the TIPSYS uncertainty is applied on a quarter axial segment basis. For the GETAB methodology the component associated with σ_{PAL} is conservatively assumed to be correlated for all four bundles around the TIP so that in the model inputs all the values are combined to obtain σ_{TIPSYS}=8.6% [[ ]]. Thus from Eq. (3) above it is evident that for the GETAB methodology and associated uncertainties $\sigma_B = 4.3\%$.

For the reduced uncertainties applied to the Revised methodology the associated input values are [[ ]] as indicated in the fifth row of Table 4.2 of NEDC-32694P-A. These lower values are **not** used to calculate the SLMCPR for Quad Cities Unit 1, Cycle 18 but have been presented here as an example of how the Revised methodology with reduced uncertainties compares with the GETAB methodology with the original power distribution uncertainties.

Applying the same Revised methodology using the higher bundle power uncertainty of 4.3% associated with GETAB power distribution uncertainties [[ ]] resulting in an effective total bundle

[[ ]]
[[ ]]

power uncertainty of $\sigma_B = 4.3\%$ (as expected). Application of the GETAB uncertainty values in this way is presented in Section 2.10 of NEDC-32601P-A (Reference 4). Some calculated results are presented in Table 4.1 of NEDC-32601P-A. This process has been reviewed and approved by the NRC in accepting the Revised methodology. Since this is the process that has been followed, Table 4.1 of NEDC-32601P-A is cited in Table 2 of Attachment A of Reference 2.

For specific application to Quad Cities Unit 1, Cycle 18 an effective total bundle power uncertainty of 5.0% has been specified. This value is even more conservative than the 4.3% value used in GETAB. When applied using the NRC-approved Revised SLMCPR methodology the key inputs become [[ ]] resulting in an effective total bundle power uncertainty of $\sigma_B = 5.0\%$ as stipulated.

This discussion has shown how the values presented in the last four rows of Table 2 of Attachment A of Reference 2 are derived. The impact on the calculated SLMCPR of using the Revised methodology instead of the GETAB methodology is indicated in Table 4.1 of NEDC-32601P-A. [[ ]] Typically for a calculated SLMCPR around 1.10 the calculated SLMCPR will be approximately [[ ]] lower if the Revised methodology is used instead of GETAB methodology. The reason for this reduction even when equivalent power distribution uncertainties are used is given on page 4-7 of NEDC-32601P-A.

Question 2

Based on a plant/cycle specific calculation, describe in detail your calculation process, including approved methodology used, to model [[ ]] Justify that the proposed approach and the assumption for this analysis are valid through the entire cycle operation [[ ]].

Response

The approved methodology used is the Revised methodology described in detail in NEDC-32601P-A (Reference 4).

The section titled "***Assessment of Potential Penalty [[ ]]***" in Attachment F of Reference 1 described in detail the process that was used [[ ]] for the calculated results that are superseded by the results described in Attachment A of Reference 2. Note that the statement in the second paragraph of the cited section of the earlier document that states [[ ]] **no longer applies.**

For the current analysis as summarized in Attachment A of Reference 2: [[ ]]. This is a result of the fact that at the limiting point in the cycle for purposes of setting the SLMCPR (near end of cycle (EOC)) [[ ]] These are the values agreed to by the NRC.

Since the SLMCPR is most limiting near EOC [[ ]] other exposure points in the cycle will produce lower calculated SLMCPR values [[ ]]

Question 3

Figure 2 of Attachment F (Reference 1) and Figure 2 of Attachment A (Reference 2) show that Reference Core Loading Pattern for Cycle 18 is a mixed core which consists of 296 fresh GE14 fuel bundles, 235 once burned ATRIUM-9 fuel bundles and 193 twice burned ATRIUM-9 fuel bundles. Identify the most influential factors which may impact the calculation of the proposed SLMCPR in this mixed core condition. Justify that the approved topical report, NEDC-32981P, Revision 0, "GEXL96Correlation for ATRIUM-9B Fuel" is still valid for ATRIUM-9 fuel and your

approach for core bundle-by-bundle MCPR distribution and bundle pin-by-pin power/R-factor distribution is still valid for the mixed core (with other vendor's fuel) SLMCPR calculation.

Response

All of the once burnt and twice burnt fuel in Quad Cities Unit 1 Cycle 18 (Q1C18) is ATRIUM 9B fuel.

The calculated SLMCPR in this core as in all cores is most strongly influenced by the fuel bundles with the highest reactivity. At beginning of cycle (BOC) this usually includes some fuel bundles that were loaded in the previous cycle. For larger batch fractions the relative contribution of bundles from the previous cycle is less important. Notice that for Cycle 18 the latest batch has a 40.9% batch fraction. This implies that throughout the cycle that the SLMCPR will be dominated by bundles loaded for this cycle. It also implies that the BOC SLMCPR will tend to be very low because the core Minimum Critical Power Ratio (MCPR) distribution will be quite peaked in order to accommodate such a high batch fraction. So although the core is a mixed core, the SLMCPR will be dominated by the response of the GE14 fuel. Note, however, that the analyses methodology is applicable to mixed cores [[ ]]

Consequently, it is the critical power response of the GE14 fuel that is most important. The impact on the calculated SLMCPR is dominated by two primary considerations [[ ]]

Question 4

Explain the cause of the large reduction of SLMCPR value from Cycle 17A to Cycle 18, and identify the differences in the analysis for the SLMCPR calculation between GE's and other fuel vendor. Also, identify the errors made in the SLMCPR calculations in Reference 1 and explain why there is no impact on the final SLMCPR values.

Response

The calculated 1.10 SLMCPR value for Cycle 18 is well within GNF-A's experience bases [[ ]]

The difference in SLMCPR values between Q1C17A and Q1C18 is attributed to the following effects.

1. The GNF GE10/FANP ATRIUM 9B fuel in Q1C17A and the FANP ATRIUM 9B/GNF GE14 fuel in Q1C18 have different applicable CPR correlations and correlation uncertainties.
2. Q1C17A and Q1C18 have different core radial and axial power distributions.
3. Q1C17A FANP SLMCPR calculations include the effects of channel bow in the uncertainties used [[ ]].
4. Different computer code packages are used for the analysis methodology. FANP analysis methodology is used for Q1C17A and GNF analysis methodology is used for Q1C18. Both methodologies are NRC-approved.

Due to differences in fuel vendors, fuel designs, and vendor methodology between the Q1C17A and Q1C18 reloads, no specific analyses can be performed to quantitatively determine what portion of the SLMCPR change is separately due to each of the four effects identified above.

[[ ]]
[[ ]]

The error that was made in calculating the SLMCPR presented in Reference 1 [[ ]] From the section titled "***Assessment of Potential Penalty [[ ]]***" in Attachment F of Reference 1 it was noted that [[ ]] would have required the requested SLMCPR to increase except for two things: (1) the requested 1.10 SLMCPR was 0.00725 higher than the calculated value and (2) application of the NRC-approved Revised methodology provides for a reduction in the calculated SLMCPR by about [[ ]]

References

1. Letter from P. R. Simpson (Exelon Generation Company, LLC) to U.S. NRC, "Request for Technical Specifications Change for Minimum Critical Power Ratio Safety Limit," dated May 30,2002.

2. Letter from P. R. Simpson (Exelon Generation Company, LLC) to U.S. NRC, "Supplemental Request for Technical Specifications Change for Minimum Critical Power Ratio Safety Limit," dated August 15, 2002.

3. NEDC-32694P-A, "Power Distribution Uncertainties for Safety Limit MCPR Evaluations," dated August 1999.

4. NEDC-32601P-A, "Methodology and Uncertainties for Safety Limit MCPR Evaluations," dated August 1999.

5. Letter from Glen A. Watford (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with Attention to J. Donoghue (NRC), "Final Presentation Material for GEXL Presentation – February 11, 2002," FLN-2002-004, dated February 12, 2002.

[[ ]]
[[ ]]

Attachment C

Global Nuclear Fuel Affidavit

Affidavit

I, Jens G. Andersen, state as follows:

(1) I am Fellow and project manager, TRACG Development, Global Nuclear Fuel – Americas, L.L.C. ("GNF-A") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in the attachment, "REQUEST FOR ADDITIONAL INFORMATION RELATING TO AMENDMENT REQUEST FOR CYCLE 18 SLMCPR QUAD CITIES NUCLEAR POWER STATION, UNIT 1 DOCKET NO. 50-254 2002."

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GNF-A relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4) and 2.790(a)(4) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information," and some portions also qualify under the narrower definition of "trade secret," within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GNF-A's competitors without license from GNF-A constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals cost or price information, production capacities, budget levels, or commercial strategies of GNF-A, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future GNF-A customer–funded development plans and programs, of potential commercial value to GNF-A;

e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b., above.

(5) The information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GNF-A, and is in fact so held. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in (6) and (7) following. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GNF-A, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GNF-A. Access to such documents within GNF-A is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GNF-A are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2) is classified as proprietary because it contains details of GNF-A's fuel design and licensing methodology.

The development of the methods used in these analyses, along with the testing, development and approval of the supporting methodology was achieved at a significant cost, on the order of several million dollars, to GNF-A or its licensor.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GNF-A's competitive position and foreclose or reduce the availability of profit–making opportunities. The fuel design and licensing methodology is part of GNF-A's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC–approved methods.

The research, development, engineering, analytical, and NRC review costs comprise a substantial investment of time and money by GNF-A or its licensor.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GNF-A's competitive advantage will be lost if its competitors are able to use the results of the GNF-A experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GNF-A would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GNF-A of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed at Wilmington, North Carolina, this 17 day of October, 2002.

Jens G. Andersen
Global Nuclear Fuel – Americas, LLC